



**VERIFICATION OF THE SEECOF-21  
SUMMER 2019 CLIMATE OUTLOOK  
AND  
SEASONAL BULLETIN  
FOR THE TERRITORY OF UKRAINE**

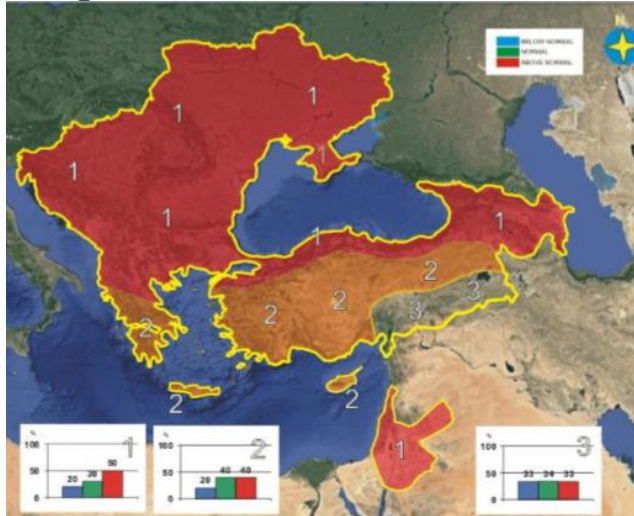
**Kyiv, 17 October 2019**

**UKRAINIAN HYDROMETEOROLOGICAL CENTER  
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# VERIFICATION OF THE SEECOF– 21 SUMMER 2019 CLIMATE OUTLOOK FOR THE TERRITORY OF UKRAINE COMPARED TO THE 1981–2010 BASE PERIOD

## Temperature

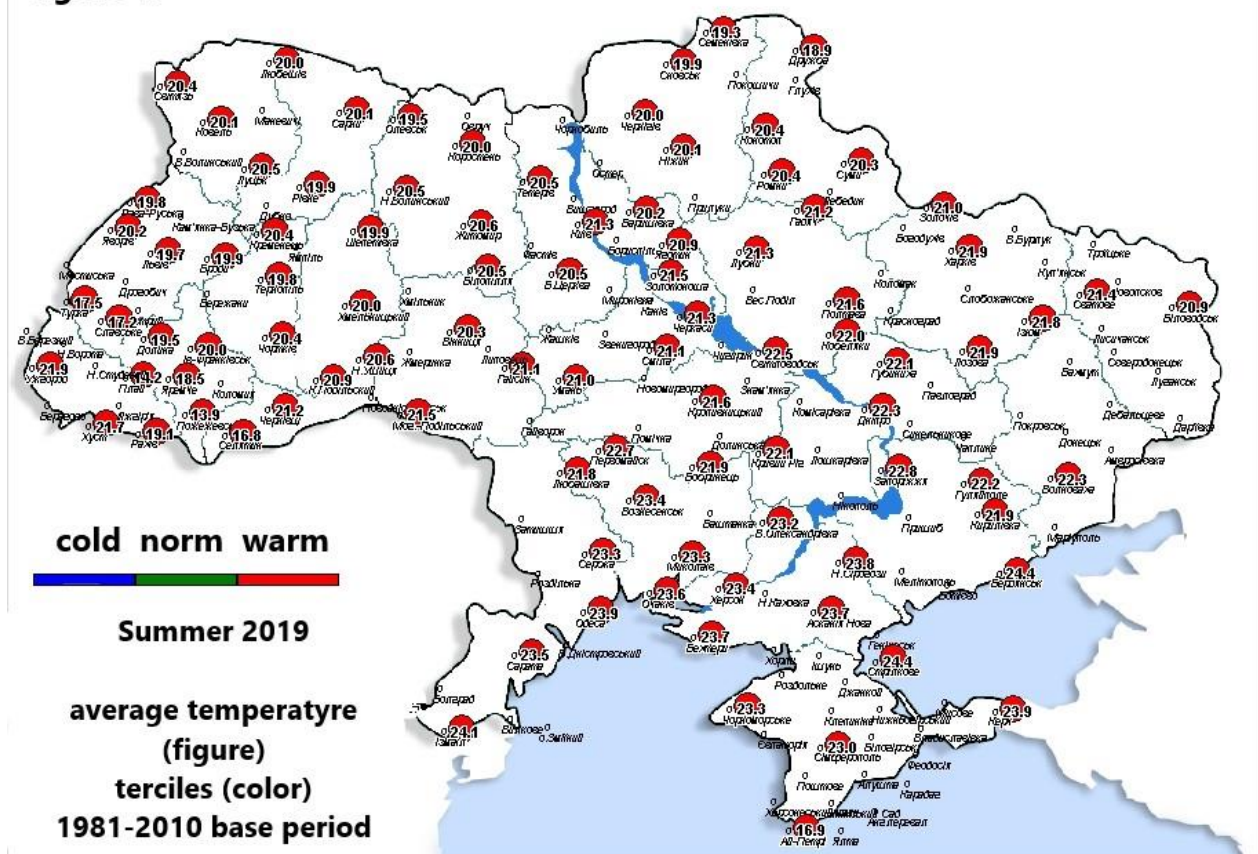


According to the SEECOF-21 outlook for the summer 2019 in Ukraine, seasonal temperature was expected warmer (upper tercile) with 50% probability, normal with 30% and below (low tercile) with 20% probability, compared to the 1981–2010 climatological base period.

Climatological monitoring showed that the summer 2019 was warm in Ukraine with above normal temperature based on the tercile method (Figure 1).

Verification showed that the temperature reached upper tercile which was indicated in the outlook with the 50% probability.

**Figure 1.**



Note: Tercile analysis of meteorological elements was performed on the basis of the data obtained from 94 main meteorological stations.

Summer 2019			Air Temperature (°C)				
synop		Station	Rank	33	50	66	Observed
1	33526	Ivano-Frankivsk	1	17.6	18.1	18.3	20.0
2	33889	Izmail	3	21.5	21.9	22.5	24.1
3	34415	Izym	9	19.7	20.5	20.9	21.8
4	33998	Ai-Petri	5	14.4	15.1	15.5	16.9
5	99915	Askaniya Nova	5	21.6	21.9	22.5	23.7
6	33464	Bila Cerkva	8	18.5	18.8	19.6	20.5
7	34434	Bilovodsk	21	19.6	20.3	20.8	20.9
8	33446	Bilopillya	2	18.1	18.4	18.7	20.5
9	33354	Baryshyvka	8	18.6	19.0	19.1	20.2
10	34717	Berdiyansk	9	22.3	23.1	23.6	24.4
11	33907	Behtery	6	21.5	22.0	22.5	23.7
12	33717	Bobryniec	10	20.2	20.9	21.0	21.9
13	33297	Brody	2	17.5	17.9	18.3	19.9
14	33862	V.Oleksandrivka.	9	21.1	21.6	22.1	23.2
15	33562	Vinnyca	5	18.0	18.3	18.6	20.3
16	33777	Voznesensk	5	21.5	21.8	22.1	23.4
17	34615	Volnovaha	10	19.8	20.9	21.5	22.3
18	33376	Hadyach	5	18.8	19.4	20.0	21.2
19	33577	Haisyn	5	18.9	19.1	19.4	21.1
20	34407	Hybinyha	8	19.5	20.6	21.2	22.1
21	34606	Hyliai Pole	9	19.9	20.9	21.4	22.2
22	34504	Dnipro	11	20.1	21.2	21.8	22.3
23	33524	Dolyna	1	16.7	17.4	17.9	19.5
24	33058	Dryzhba	13	17.6	18.1	18.3	18.9
25	33325	Zhitomyr	3	17.9	18.1	18.8	20.6
26	34601	Zaporizzhya	9	20.8	21.6	22.0	22.8
27	33484	Zolotonosha	6	19.4	19.8	20.2	21.5
28	34208	Zolochiv	5	18.7	19.4	19.9	21.0
29	33548	Kamyanec-Podilskiy	4	18.4	18.9	19.2	20.9
30	33983	Kerch	9	21.5	22.3	22.7	23.9
31	33345	Kyiv	6	19.1	19.5	19.8	21.3
32	34609	Kyrylivka	8	19.4	20.5	21.0	21.9

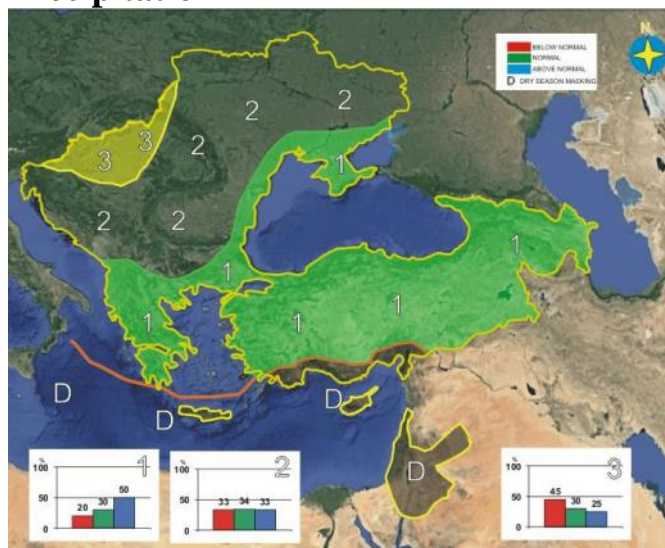
33	33621	Kobelyaky	9	19.7	20.8	21.2	22.0
34	33173	Kovel	2	17.7	18.0	18.5	20.1
35	33261	Konotop	9	18.6	19.1	19.5	20.4
36	33215	Korosten	4	17.9	18.2	18.4	20.0
37	33299	Kremenec	1	17.7	17.9	18.4	20.4
38	33791	Kryviy Rih	10	20.4	20.9	21.1	22.1
39	33711	Kropyvnutsky	7	19.5	20.2	20.4	21.6
40	34409	Lozova	10	19.6	20.4	21.1	21.9
41	33377	Lubnu	6	19.2	19.8	20.1	21.3
42	33187	Luck	2	17.7	18.0	18.5	20.5
43	33393	Lviv	1	17.0	17.4	18.0	19.7
44	33761	Liybashivka	7	19.9	20.2	20.5	21.8
45	33075	Lybeshiv	2	17.6	18.0	18.2	20.0
46	33846	Mykolaiv	9	21.7	22.3	22.6	23.3
47	33663	Mohyliv-Podilskiy	8	19.5	19.9	20.2	21.5
48	33312	Novohrad Volynskiy	2	17.7	18.1	18.4	20.5
49	33877	Nyzhni Sirohozy	5	21.1	21.8	22.3	23.8
50	33557	Nova Ushica	4	18.0	18.5	18.9	20.6
51	33246	Nizhin	7	18.3	18.7	19.1	20.1
52	33837	Odesa	4	21.3	21.6	21.8	23.9
53	33203	Olevsk	4	17.6	17.8	18.1	19.5
54	33848	Ochakiv	5	21.4	21.8	22.0	23.6
55	33699	Pervomaisk	9	20.4	20.9	21.1	22.7
56	33515	*Play	2	11.1	11.5	12.2	14.2
57	33646	Pozhezhevskya	3	11.1	11.6	12.0	13.9
58	33506	Poltava	7	19.2	20.1	20.6	21.6
59	33301	Rivne	2	17.5	17.8	18.3	19.9
60	33287	Rava-Ryska	1	17.2	17.6	18.1	19.8
61	33647	Rahiv	2	16.8	17.4	17.7	19.1
62	33268	Romny	7	18.6	19.1	19.4	20.4
63	33946	Simferopol	6	20.6	21.4	21.6	23.0
64	33896	Sarata	4	21.0	21.7	22.0	23.5
65	33088	Sarny	4	17.9	18.2	18.5	20.1
66	33614	Svitlovodsk	7	20.4	21.0	21.3	22.5
67	33067	Svityaz	2	17.8	18.0	18.7	20.4

68	34421	Svatove	13	19.7	20.3	21.0	21.4
69	33657	Selyatyn	2	14.4	14.9	15.2	16.8
70	33049	Semenivka	9	17.8	18.2	18.5	19.3
71	33833	Serbka	6	21.2	21.5	21.8	23.3
72	33516	Slavske	<b>1</b>	14.7	15.3	15.5	17.2
73	33593	Smila	10	19.2	19.9	20.2	21.1
74	33961	Strilcove	5	22.0	22.6	23.0	24.4
75	33275	Symy	8	18.4	19.0	19.4	20.3
76	33415	Ternopil	<b>1</b>	17.2	17.5	18.1	19.8
77	33228	Teteriv	7	18.5	18.7	19.0	20.5
78	33511	Tyrka	<b>1</b>	15.1	15.6	15.9	17.5
79	33631	Uzhhorod	3	19.5	19.9	20.2	21.9
80	33587	Uman	5	18.8	19.1	19.4	21.0
81	34300	Kharkiv	8	19.4	20.1	20.7	21.9
82	33902	Kherson	9	21.6	21.9	22.3	23.4
83	33429	Khmelnitskiy	3	17.6	17.9	18.2	20.0
84	33638	Khyst	<b>1</b>	19.0	19.4	19.9	21.7
85	33487	Chercasy	6	19.1	19.7	20.0	21.3
86	33658	Chernivci	2	18.6	18.9	19.4	21.2
87	33135	Chernihiv	9	18.4	18.8	19.0	20.0
88	33924	Chornomorske	5	21.4	21.8	22.2	23.3
89	33536	Chortkiv	<b>1</b>	17.8	18.1	18.6	20.4
90	33317	Shepetivka	2	17.5	17.8	18.3	19.9
91	33136	Snovsk	9	18.3	18.7	19.0	19.9
92	33392	Yavoriv	<b>1</b>	17.5	17.8	18.4	20.2
93	33356	Yahotyn	9	19.0	19.4	19.6	20.9
94	33645	Yaremche	2	16.0	16.5	16.7	18.5

Rank – 1961-2019 (warmest season), \*Play – rank 1981-2019



# Precipitation

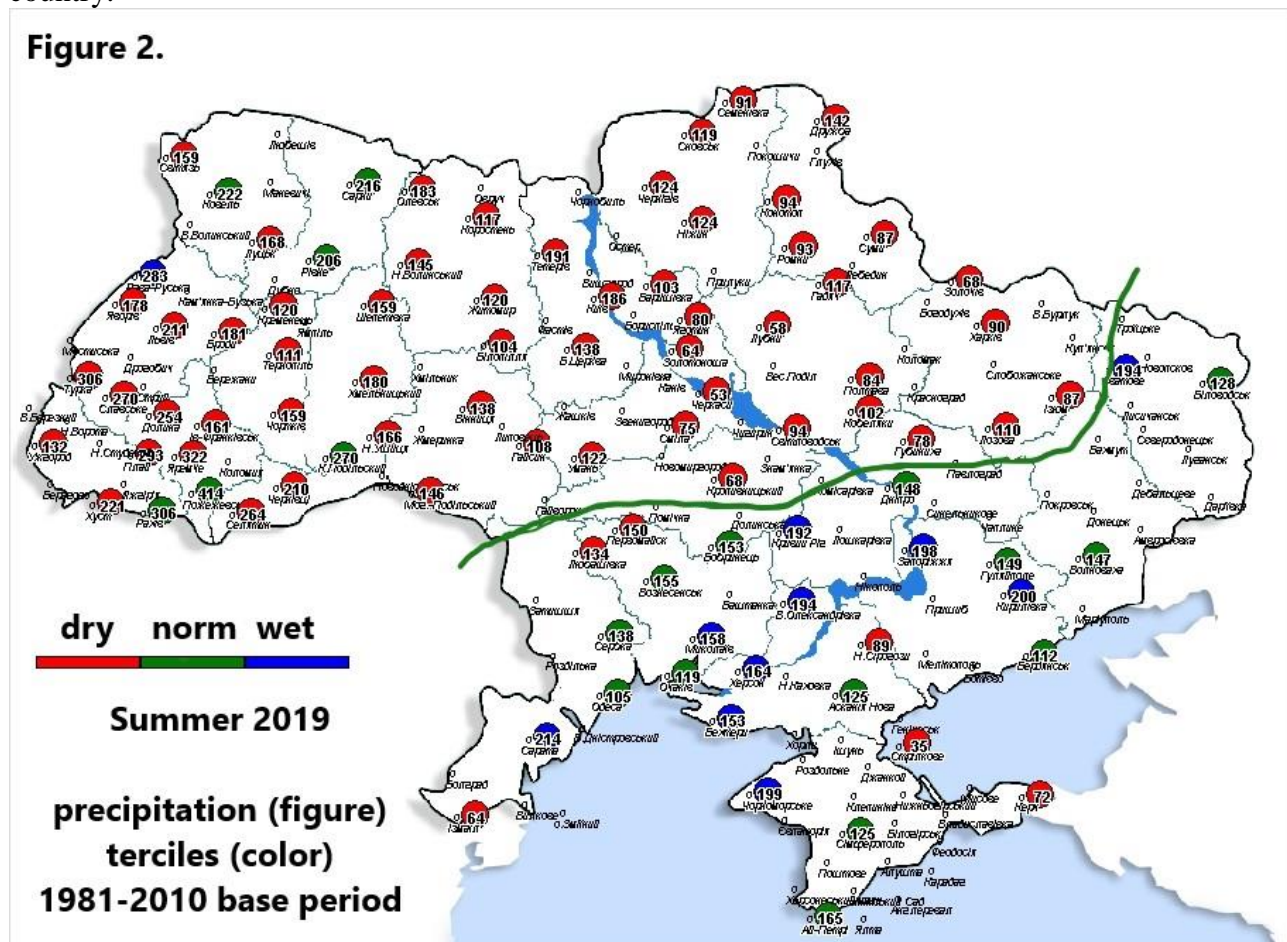


The SEECOF–21 climate outlook indicated approximately equal probabilities for below-, near- or above normal precipitation for most part of Ukraine and more wet conditions (50% probabilities) for the south part and more dry conditions (45 % probabilities) for small part in the west of Ukraine.

Monitoring of precipitation showed unequal distribution dry, normal and wet summer conditions across the country. Most of the territory of Ukraine was in a dry range (67% of stations), normal conditions were on 21% of stations and wet conditions were fixed by 12% of stations based on the tercile method with 1981–2010 climatological base period (Figure 2).

In western, northern and central parts of the country were prevailed dry conditions. On the rest of the territory (south and southeast) were dominated normal and wet conditions. Seasonal forecast was more corrected for the southern part of the country.

**Figure 2.**



Summer 2017			Precipitation (mm)				
synop		Station	Rank	33	50	66	Observed
1	33526	Ivano-Frankivsk	10	215	236	283	161
2	33889	Izmail	6	112	125	143	64
3	34415	Izym	6	138	154	169	87
4	33998	Ai-Petri	30	138	153	212	165
5	99915	Askaniya Nova	34	94	109	149	125
6	33464	Bila Cerkva	10	189	219	230	138
7	34434	Bilovodsk	29	114	133	153	128
8	33446	Bilopillya	4	210	220	253	104
9	33354	Baryshyvka	4	195	224	262	103
10	34717	Berdiyansk	34	81	96	132	112
11	33907	Behtery	46	68	83	117	153
12	33717	Bobryniec	24	151	182	198	153
13	33297	Brody	11	209	242	290	181
14	33862	V.Oleksandrivka.	48	131	154	169	194
15	33562	Vinnyca	7	201	221	273	138
16	33777	Voznesensk	26	152	170	189	155
17	34615	Volnovaha	35	121	143	175	147
18	33376	Hadyach	4	161	174	207	117
19	33577	Haisyn	4	183	201	229	108
20	34407	Hybinyha	4	141	163	176	78
21	34606	Hyliai Pole	32	119	130	153	149
22	34504	Dnipro	33	130	146	159	148
23	33524	Dolyna	8	290	350	384	254
24	33058	Dryzhba	9	197	220	260	146
25	33325	Zhitomyr	5	195	242	271	120
26	34601	Zaporizzhya	47	119	148	158	198
27	33484	Zolotonosha	1	170	186	211	64
28	34208	Zolochiv	3	147	177	200	68
29	33548	Kamyane-Podilskiy	41	214	245	297	270
30	33983	Kerch	9	94	110	139	72
31	33345	Kyiv	18	199	216	231	186
32	34609	Kyrylivka	40	130	150	198	200

33	33621	Kobelyaky	10	115	137	167	102
34	33173	Kovel	31	190	229	266	222
35	33261	Konotop	2	170	189	202	94
36	33215	Korosten	4	187	227	269	117
37	33299	Kremenec	2	219	245	310	120
38	33791	Kryviy Rih	47	137	149	169	192
39	33711	Kropyvnutsky	1	152	181	213	68
40	34409	Lozova	12	123	165	183	110
41	33377	Lubnu	1	175	194	250	58
42	33187	Luck	20	171	200	237	175
43	33393	Lviv	17	221	251	287	217
44	33761	Liybashivka	16	145	168	204	134
45	33075	Lybeshiv	2	229	271	274	118
46	33846	Mykolaiv	45	104	114	131	158
47	33663	Mohyliv-Podilskiy	10	201	231	267	146
48	33312	Novohrad Volynskiy	4	216	232	258	145
49	33877	Nyzhni Sirohozy	15	110	129	155	89
50	33557	Nova Ushica	9	211	262	303	166
51	33246	Nizhin	2	200	218	234	124
52	33837	Odesa	22	98	128	164	105
53	33203	Olevsk	10	214	252	287	183
54	33848	Ochakiv	32	91	109	123	119
55	33699	Pervomaisk	18	169	201	243	150
56	33515	*Play	10	365	424	485	293
57	33646	Pozhezhevskya	21	404	455	478	419
58	33506	Poltava	5	154	170	196	84
59	33301	Rivne	23	195	236	256	206
60	33287	Rava-Ryska	51	215	230	257	310
61	33647	Rahiv	19	286	314	378	306
62	33268	Romny	1	178	189	228	93
63	33946	Simferopol	24	100	136	179	125
64	33896	Sarata	49	126	150	195	214
65	33088	Sarny	34	205	224	275	228
66	33614	Svitlovodsk	8	147	173	208	94
67	33067	Svityaz	14	186	209	231	159



68	34421	Svatove	47	133	152	168	194
69	33657	Selyatyn	6	310	384	435	264
70	33049	Semenivka	2	182	209	241	91
71	33833	Serbka	24	136	150	178	138
72	33516	Slavske	12	304	378	418	270
73	33593	Smila	<b>1</b>	159	176	217	75
74	33961	Strilcove	5	71	93	130	35
75	33275	Symy	<b>1</b>	161	189	213	87
76	33415	Ternopil	<b>1</b>	204	242	268	111
77	33228	Teteriv	19	196	224	270	191
78	33511	Tyrka	17	326	350	369	306
79	33631	Uzhhorod	5	185	204	264	132
80	33587	Uman	4	197	219	253	122
81	34300	Kharkiv	5	128	143	171	90
82	33902	Kherson	50	90	105	128	164
83	33429	Khmelnitskiy	10	241	264	313	181
84	33638	Khyst	14	241	282	354	221
85	33487	Chercasy	<b>1</b>	169	193	206	53
86	33658	Chernivci	21	230	263	275	210
87	33135	Chernihiv	9	170	197	210	124
88	33924	Chornomorske	55	54	67	90	199
89	33536	Chortkiv	6	207	246	275	159
90	33317	Shepetivka	5	224	257	294	159
91	33136	Snovsk	5	169	215	245	119
92	33392	Yavoriv	5	242	261	279	180
93	33356	Yahotyn	<b>1</b>	176	198	229	80
94	33645	Yaremche	15	372	400	452	322

Rank – 1961-2019 (Driest season), \*Play – rank 1981-2019

## Assessment of the SEECOF-19 Climate outlook for summer 2019

Country	Seasonal Temperature (JJA)		Seasonal Precipitation (JJA)		High impact Events
	Observed	SEECOF-21 climate outlook	Observed	SEECOF-21 climate outlook	
Ukraine	above normal	above normal	below normal (67% stations)  normal (21% stations)  above normal (12% stations)	below normal 33%  normal 34%  above normal 33%  southern part above 50%  normal 30%  below 20%	<p>During the summer season, meteorological extraordinary phenomenas were observed in many regions of the country.</p> <p>In June were recorded heavy rains (30-60 mm precipitation per 2-9 hours, 05/06 in Hivoron 104 mm/7h and in Nova Kahovka 93/5h, 19/06 in Rava-Ruska 83/3h), showers (32-46 mm per hour), squalls (speed 25 m/c), big hail (diameter 23-30 mm).</p> <p>In July were recorded heavy rains (30-70 mm precipitation per 2-9 hours), squalls (speed 26-30 m/c).</p> <p>In August were recorded heavy rains (30-76 mm precipitation per 2-12 hours, 04/08 in Horly 105 mm/8h and in Bilgorod-Dnistrovsky 121 mm/6h, 14/08 in Drohobych 90 mm/10h), big hail (diameter 27 mm), 13/08 in Chernivtsy region was big hail with diameter 60 mm.</p> <p>Unfavorable weather conditions locally caused loss power, telecommunications, utilities and transport.</p> <p>Summer was hottest in some places in the western part of Ukraine of the last 58 years.</p> <p>June was the warmest for the entire period of meteorological observations, maximum temperatures were 30...37 °C.</p> <p>Summer was arid in most parts of Ukraine, in the north and in the center were areas with driest conditions from 1961.</p>

# Analysis of the summer 2019 season for Ukraine compared to the 1981-2010 base period

## Temperature

The average air temperature during summer 2019 was from 18.9°C in the northeast to 24.7°C in the southwest and in Carpathian and Crimea mountains was 13...17°C.

Deviations the mean air summer temperature from average values of the 1981-2010 base period were +1...2.5°C (Figure.1).



Note: Climatological analysis of meteorological elements was performed on the basis of the data obtained from 163 meteorological stations.

From month to month average temperature deviation was inhomogeneous.

**June** was the **hottest** month of the summer 2019 with deviations (+3.2...5.4°C) of the average temperature from the base values (1981-2010) for Ukraine.

**In July**, the temperature conditions were close to the average values on the territory of the country with deviations in the range from -0.9 to +0.5°C, in the northern part were some places with negative deviations -1.5°C.

**August** was warm month with positive deviations +1.1...2.5°C in the western part and temperature conditions were close to the average values in the eastern part of Ukraine.

Maximum temperature was in the range from 30.5°C in Lviv region (west) to 39.0°C in Mykolaiv region (south), in Carpathian mountains (highlands) 24...25°C (Figure 2).



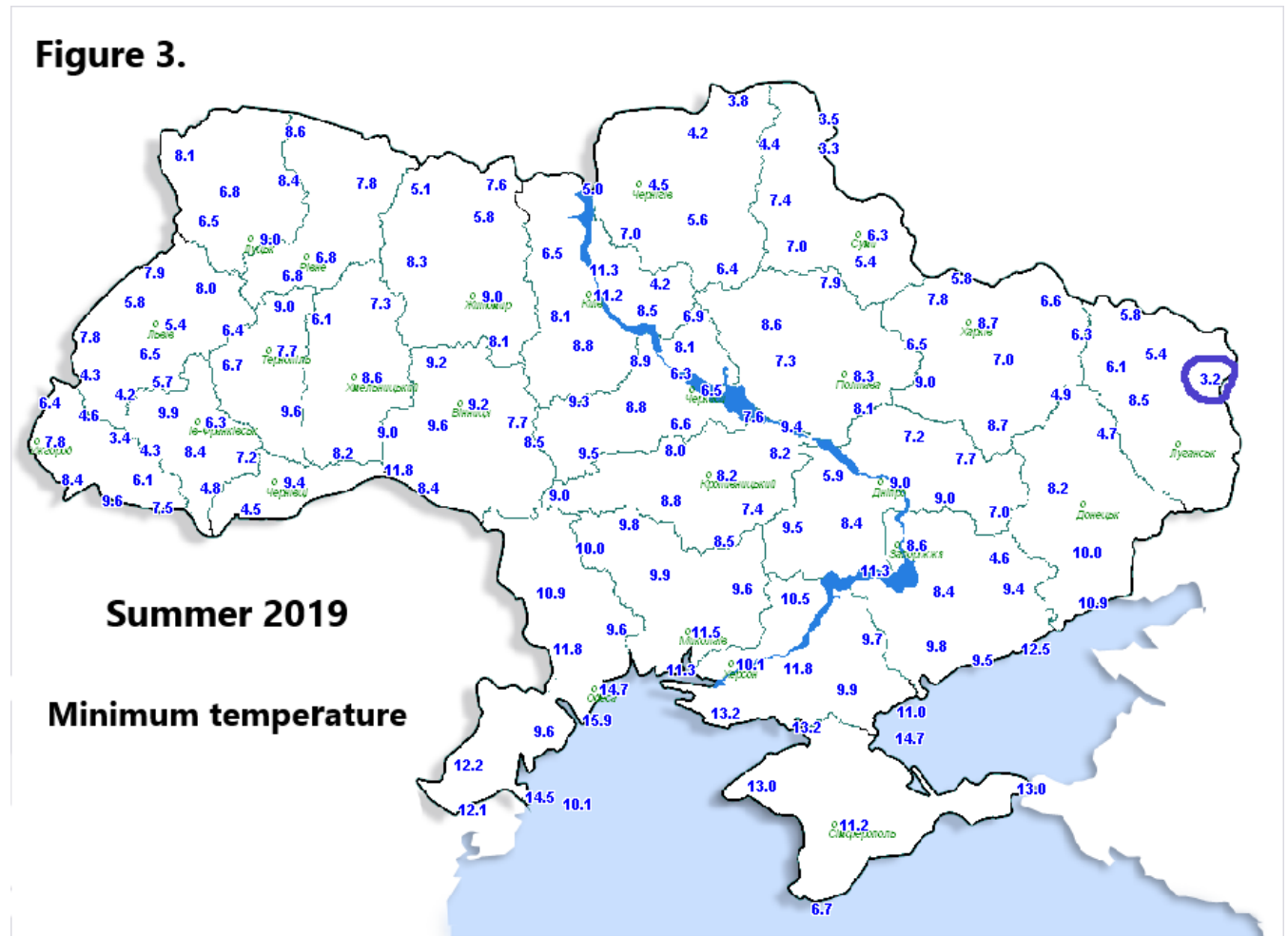
The highest daily air temperature during summer 2019, measuring 39.0°C was observed on 02<sup>th</sup> of July in Voznesensk.

Temperatura 40°C and above is a very dangerous phenomenon for Ukraine, it was not observed in summer 2019, but June was the hottest for the entire period of meteorological observations, maximum temperatures were 30...37 °C.

During the summer 2019 were four waves of hot weather 15-28<sup>th</sup> of June, 1-3<sup>th</sup> of July, 7-14<sup>th</sup> and 21-25<sup>th</sup> of August, when maximum temperatures were 34...39°C.

The number of days with maximum temperature 30°C and above was different across Ukraine. In the western and the northern parts of the country the number of tropical days were in the range from 15 to 30 days (in Carpathian mountains 3...9 days). In the southern, eastern parts and Transcarpathia the number of tropical days was in the range from 31 to 50 days and maximum was in Bolhrad (Odesa region) reached 51 and in Askania-Nova (Kherson region) 53 days. The number of days with maximum temperature 35°C and above in south and east was from 3 to 11 days, in north and west were fixed 1 or 2 days only in some places.

The minimum temperature ranged from 3.2°C in Luhansk region (east of the country) to 15.9°C on the coast of the sea in Odessa region (southwest) (Figure 3).



The lowest air temperature during summer 2019, measuring 3.2°C was observed on 29<sup>th</sup> of August in Bilovodsk of the Luhansk region.

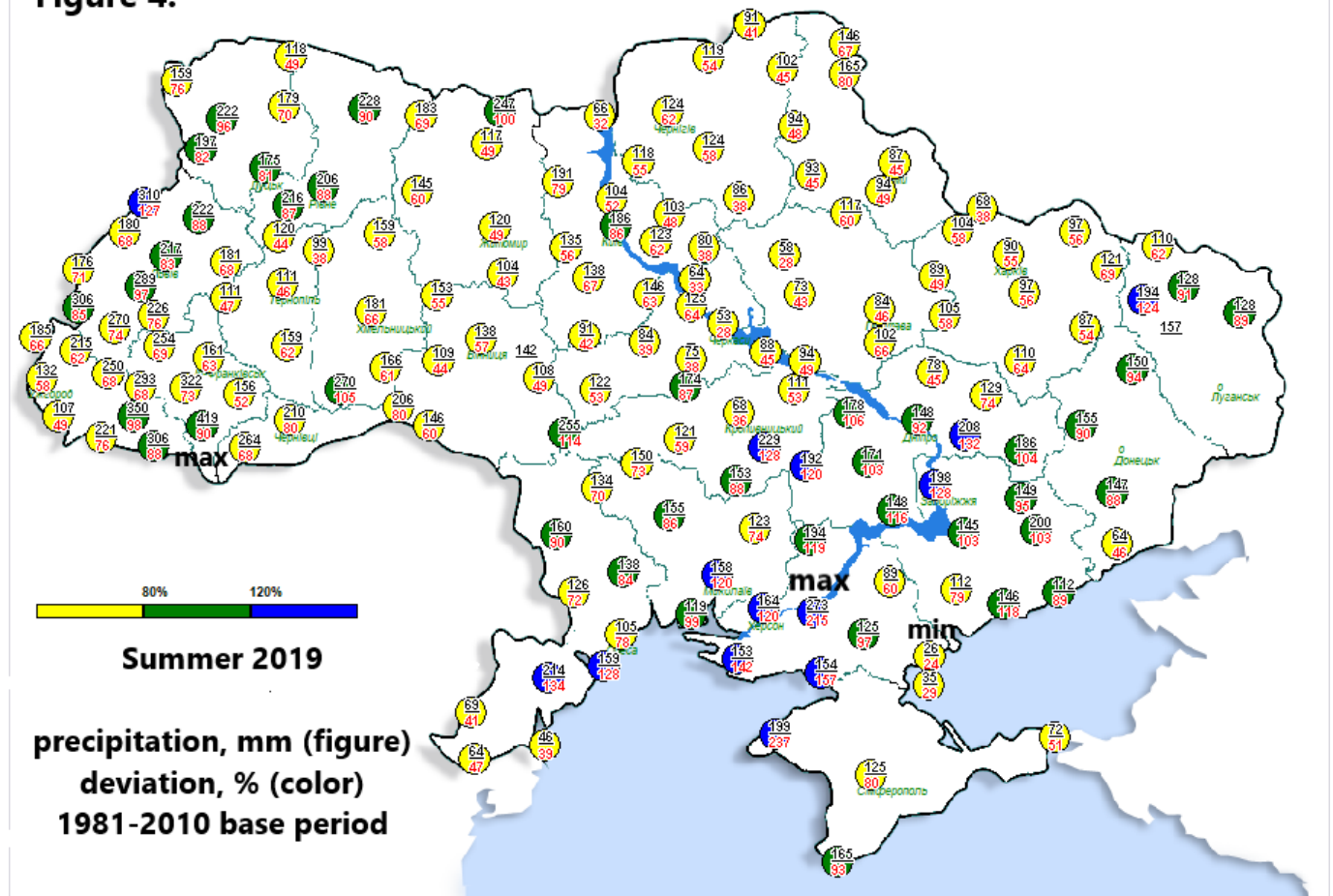
## Precipitation

In summer 2019 dry conditions were dominated in west, north and central part (38...79% of the norm), in the south and the southeast of the country were dominated normal and excess of the precipitation (84...237 %) compared to the average values of the 1981-2010 base period (Figure.4).

Seasonal precipitation was ranged from 24 mm (26% of the norm) to 273 mm (215% of the norm) in Kherson region and 419 mm (90%) in the Carpathian region (Figure 4).



**Figure 4.**



The biggest daily precipitation 05/06 in Hivoron 104 mm/7h and in Nova Kahovka 93/5h, 19/06 in Rava-Ruska 83/3h, 04/08 in Horly 105 mm/8h and in Bilgorod-Dnistrovsky 121 mm/6h, 14/08 in Drohobych 90 mm/10h.

Long rain was recorded in Zaporizhzhia on 3-4<sup>th</sup> of August – fell 121 mm of precipitation per 17 hours.

Summer 2019 was arid, in the north and in the center were areas where it was driest since 1961.

From month to month in summer precipitation was not homogeneous.

**In June** wet, normal and dry conditions were very spotted on the territory, but dry conditions were prevailed in the east.

**In July** were normal and wet conditions in most areas of the southern and eastern parts of the country, in the western and northern parts were spotted wet, normal and dry conditions.

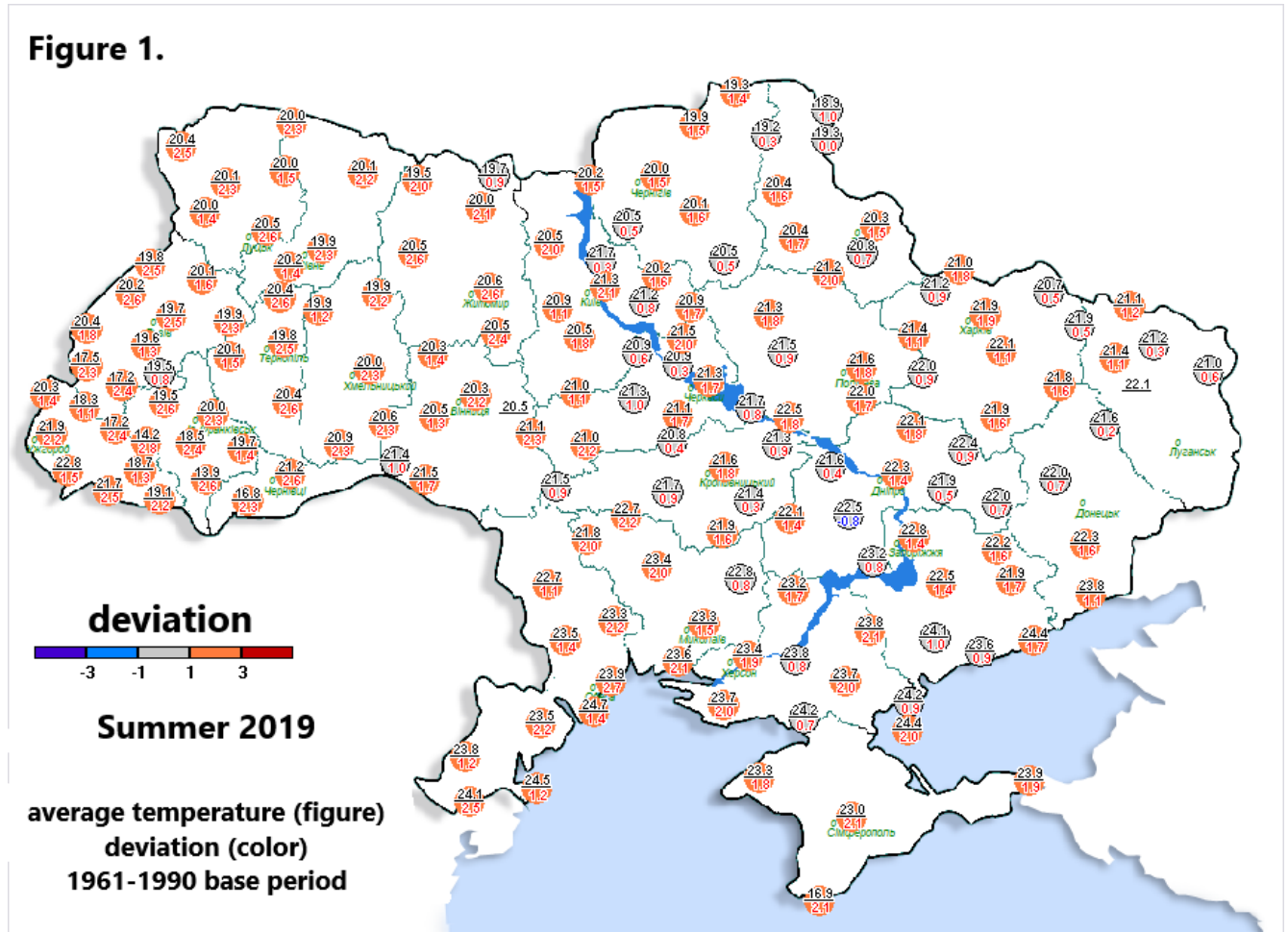
**August** was normal and wet in south and southeast, dry conditions were in the rest of the country.

# Analysis of the 2019 summer season for Ukraine compared to the 1961-1990 base period

## Temperature

Deviations of the average air temperature were +1.1...2.8°C above the climate norm (1961-1990), in some places it were not more +1.0°C (Figure 1).

Figure 1.



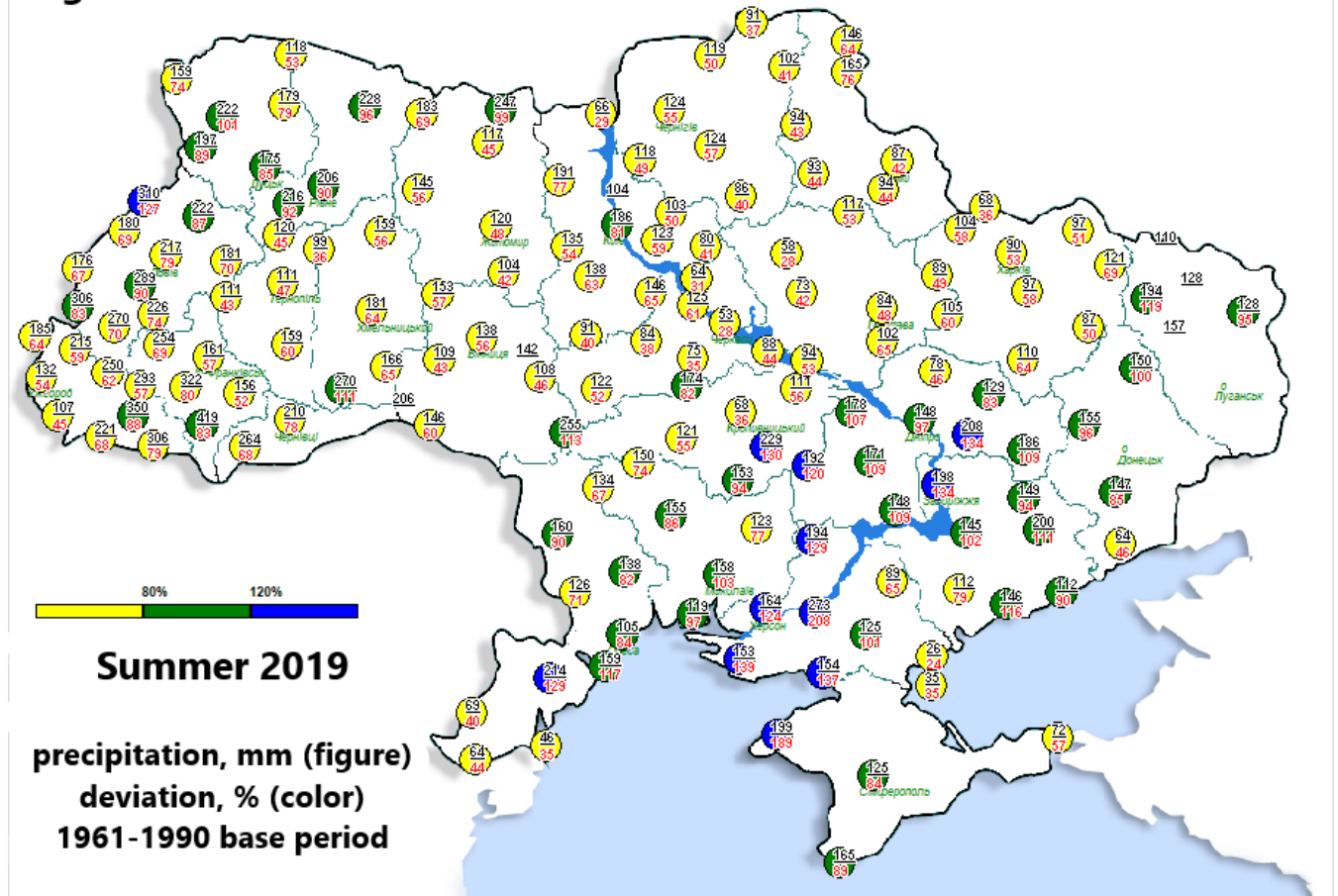
According to the tercile method (with 1961–1990 climatological norm), mean air temperature in summer was in the warm category.

## Precipitation

Unequal distribution dry, normal and wet summer conditions across the country, but most stations of the western, northern and central part recorded insufficient wetting (36-79%) compared to the 1961-1990 climate norm, but in the rest of the territory were many places with norm (80..118%) and with excess moisture (122..208%) (Figure 2).

According to the tercile method (with 1961–1990 climatological norm), summer precipitation were in the dry category at most stations of the western and northern part. In most areas of the southern and southeastern part of the country were fixed normal and wet category.

**Figure 2.**



During the summer 2019 maximum and minimum daily temperatures at most stations of Ukraine remained in the range of recorded daily absolute temperatures (min...max).

Only on separate days the maximum and minimum temperatures approached and reached fixed absolute values.

Graphs with minimum and maximum temperatures for selected cities listed below (Figure. 3, 4, 5, 6, 7).



Figure 3.

### Maximum and minimum temperature Summer 2019 Kyiv (north of Ukraine)

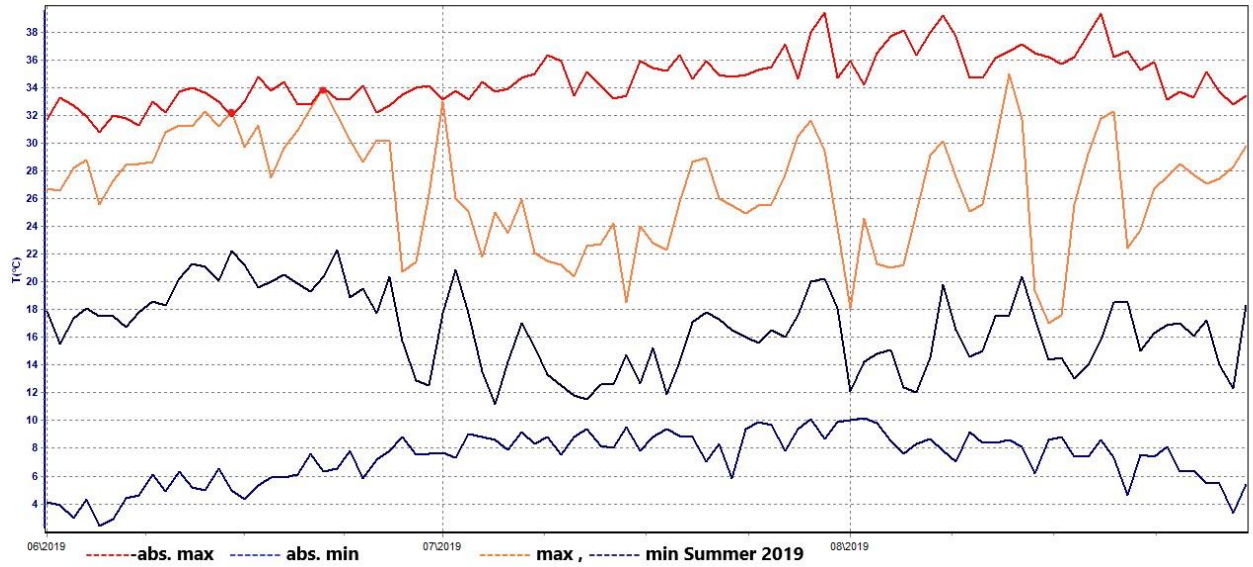


Figure 4.

### Maximum and minimum temperature Summer 2019 Lviv (west of Ukraine)

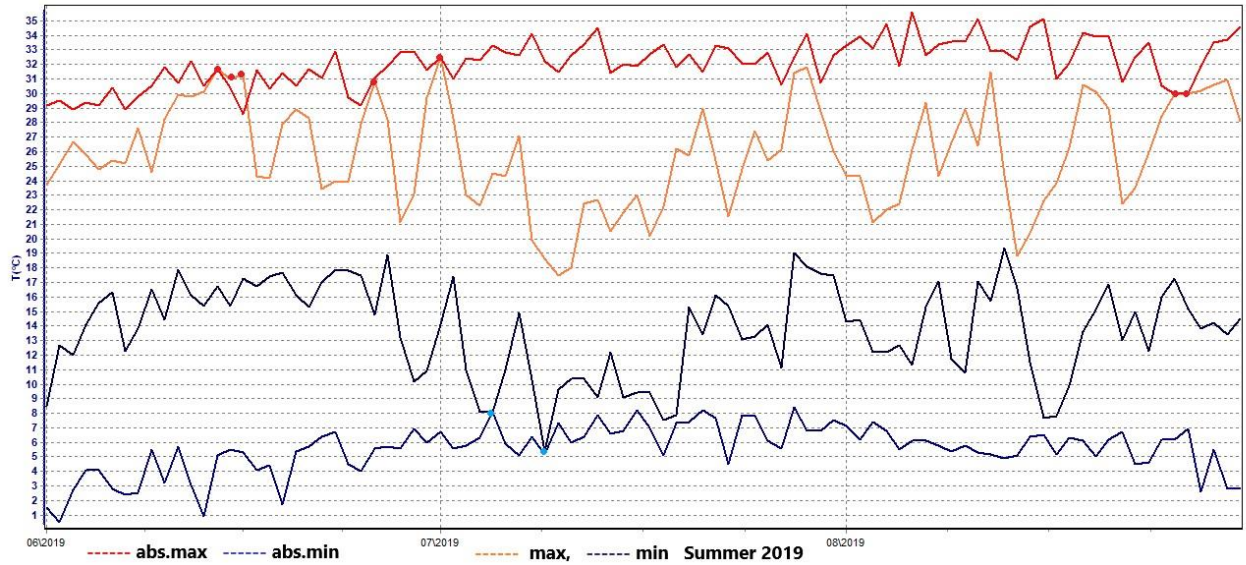


Figure 5.

### Maximum and minimum temperature Summer 2019 Kropyvnytski (center of Ukraine)

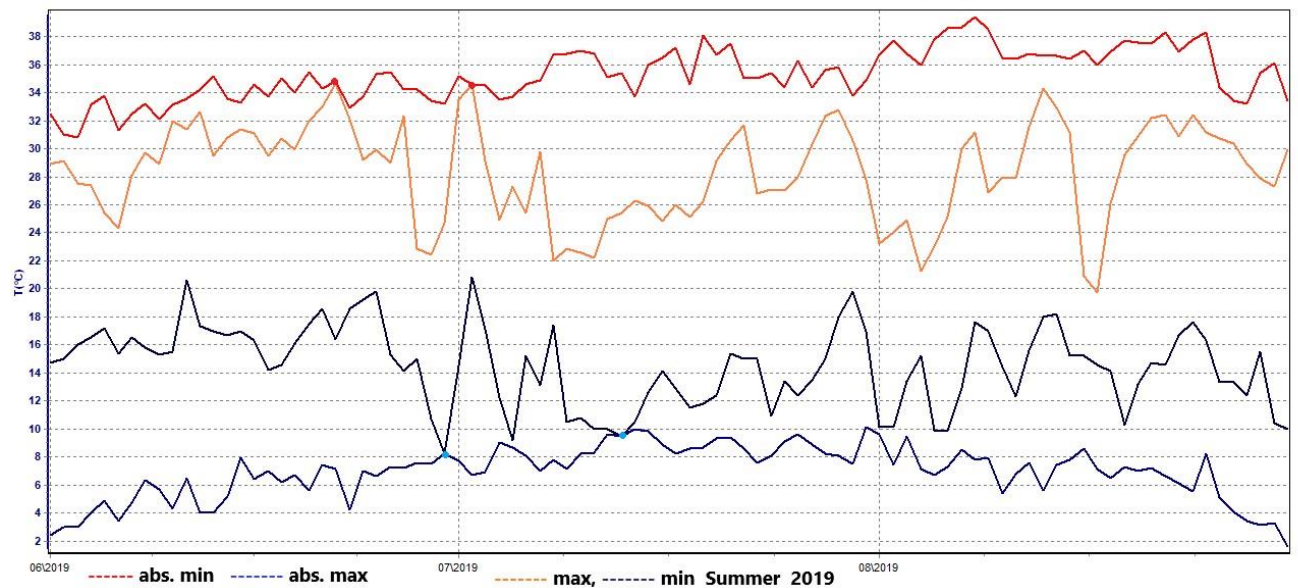


Figure 6.

### Maximum and minimum temperature Summer 2019 Kharkiv (east of Ukraine)

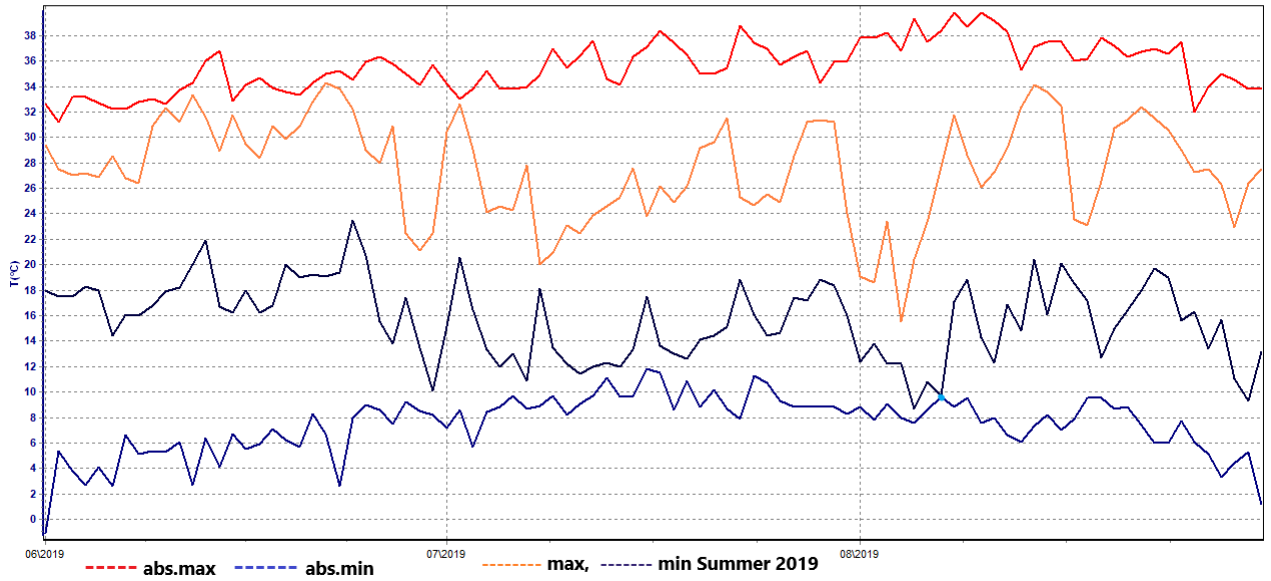


Figure 7.

### Maximum and minimum temperature Summer 2019 Kherson (south of Ukraine)

